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Indian Standard

SURFACE COVERED CULTIVATION — PLASTICS MULCHING LAYING MACHINE — FUNCTIONAL REQUIREMENTS

ICS 65.040.30

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

January 2009 **Price Group 2**

Agriculture and Food Processing Equipments Sectional Committee, FAD 20

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Agriculture and Food Processing Equipments Sectional Committee had been approved by the Food and Agriculture Division Council.

The practice of mulching in agriculture is very old. Crop residue, paper, soil, pebbles and synthetic materials have been used as mulches under diverse agro-climatic conditions. The main objectives of using the practice of mulching have been water conservation, weed control and soil temperature modification. However, pest control and carbon dioxide (CO_2) enrichment have also been observed as benefits of mulching. With the advent of plastics films, it has been possible to achieve the whole range of benefits provided the right kind of material is used correctly. Plastics mulching have become very relevant for sustainable environment-friendly agriculture because it reduces the requirements of fertilizer and agro-chemicals by better utilization efficiency. The plastics mulching also reduces soil erosion. A need has been felt to include relevant information in this standard to guide prospective users to select appropriate plastics mulch laying machine for the intended applications and use it correctly.

In the formulation of this standard, considerable assistance have been derived from Indian Agriculture Research Institute, Pusa, New Delhi.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SURFACE COVERED CULTIVATION — PLASTICS MULCHING LAYING MACHINE — FUNCTIONAL REQUIREMENTS

1 SCOPE

This standard covers the requirement and test method of plastics much laying machine, which is used for laying plastics mulch in crops such as tomato, groundnut, banana, mango, etc.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
210 : 1993	Grey iron castings — Specification (*fourth revision*)
822 : 1970	Code of procedure for inspection of welds
1570 (Part 2) : 1979	Schedules for wrought steels: Part 2 Carbon steels (unalloyed steels)
2062 : 2006	Hot rolled low, medium and high tensile structural steel (*sixth revision*)
4366 (Part 1) : 1985	Specification for agricultural tillage discs : Part 1 Concave type (*second revision*)

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Concave Discs — Circular steel plate of 400 mm diameter and 35 mm concavity, which is used for cutting and shaping and soil bed. Its metallurgy shall conform to IS 1570.

3.2 Disc Standard — A vertical bar on which disc is mounted.

3.3 Dust-Free and Self-Centering Bearings — Dust-free and self-centering bearings used for smooth and trouble free operation of discs, press wheels and transport wheels under dustry conditions.

3.4 Inverter Standard — Mild steel bar of appropriate diameter on which the inverter is mounted.

3.5 Low Density Polyethylene (LDPE) — It is branched chain polyethylene obtained by high pressure polymerization of ethylene by free radical mechanism.

3.6 Low Tunnel — A tunnel type structure made by placing hoops of steel wire/bamboo and covering with plastics film for growing crops inside them.

3.7 Main Frame — A structural frame of mild steel and of suitable sections to mount and hold firmly all the components for their proper functioning.

3.8 Plastics Film Mulching — Plastics film is used for covering the soil around the plants in order to prevent water evaporation, soil compaction through rain and wind, to restrict weed growth, etc.

3.9 Plastics Mulch Film — Plastics sheet having a nominal thickness not greater than 0.025 mm.

3.10 Press Wheel — Wheels, pneumatic or otherwise, of suitable diameter used in the machine for pressing the plastics film edges to the ground.

3.11 Roll Holder — Mild steel seamless pipes to hold the roll of plastics film.

3.12 Roll Holder Plates — Mild steel circular plates to support both edges of plastic roll for its proper alignment.

3.13 Soil Inverter — Curved, mild steel plate used to invert and put back soil on the edges of the plastics film for proper anchoring.

3.14 Springs Assembly — An assembly of springs and its frame to apply appropriate downward pressure on discs, press wheel and soil inverter.

3.15 Transport Wheel — Wheels, pneumatic or otherwise of suitable diameter used in the machine for its transportation and depth control.

3.16 Vent — A small hole made in the plastic film to allow exchange of air or gas to exit.

4 MATERIAL, FUNCTIONAL DESIGN AND CONSTRUCTION

4.1 Introduction

Plastics film mulching machine is used for laying plastic film on either raised or flat beds. Besides, it may also lay plastics film to form low tunnels or row covers on the crop.

4.2 Functional Requirement of the Machine

A plastics film mulch laying machine is envisaged to perform following operations in a single run:

a) Shaping of flat or raised beds to the required width,

b) Spreading/laying of plastics film over the surface of beds and anchoring its edges by covering with soil to prevent it from dislocation by wind, and

c) Spreading/laying of plastics film on steel/wood hoops to form low tunnels over transplanted seedlings.

4.3 Adjustments on the Plastics Film Mulch Laying Machine

The machine should provide the following adjustments:

a) *Height* — The ground clearance of the the machine should provide laying of plastic tunnels up to 400 mm of height.

b) *Width* — It should provide adjustments to use plastics film rolls of width ranging from 900 mm to 1 500 mm.

c) *Soil Cover* — It should provide adjustments to anchor the edges of plastics film of different widths.

4.4 Construction

The machine is constructed using the following components (*see* Table 1):

a) *Main Frame* — A mild steel structure of suitable sections to mount various components.

b) *Disc Assembly* — It consists of two discs of 400 mm diameter that are mounted on a frame with provision to vary disc angle and the spacing between them. Each disc is loaded with compression springs of suitable stiffness for regulating downward thrust. The disc assembly is mounted at the front to shape up the bed width.

c) *Pressing Wheels* — Two pneumatic or solid rubber wheels of about 300 mm diameter that are used to press the edges of plastics film for proper anchoring.

d) *Transport Wheel* — Two wheels, pneumatic or otherwise, of suitable diameter are used for the purpose of transportation and depth control.

e) *Plastic Film Covering Shovel* — Two shovels of appropriate curvature are used to deflect loose soil onto the edges of plastic film for proper anchoring in the ground. These are mounted on a circular rod so as to vary their angle.

Table 1 Requirements of Materials Used for Plastic Mulching Machine

(*Clause* 4.4)

Sl No.	Characteristic	Requirement	Grade	Ref to Indian Standard
(1)	(2)	(3)	(4)	(5)
i)	Frame	Mild steel	—	IS 2062
ii)	Bearing block	Cast iron	20	IS 210
iii)	Bearing	Cast iron	—	IS 210
iv)	Washer	Cast iron	20	IS 210
v)	Transport wheel	Mild steel	—	IS 2062
		Cast iron	—	IS 210
		Pneumatic wheel	—	—
vi)	Wheel standard	Mild steel		IS 2062
vii)	Disc	Carbon steel	75C 6	IS 1570 (Part 2)

4.5 Plastic Film

Basically three major colours of mulches are used commercially that is black, clear/transparent and white. Black colour sheet is used most widely because it suppresses weed growth, resulting in less chemical usage. It is also used for cool seasons because it warms the soil by contact. Soils under white mulch remain cooler because of less radiant energy absorbed by the mulch. Properties are colour types of plastic film are given in the Table 2 and Table 3.

Table 2 Physical Properties of LDPE

Sl No.	Properties	Values
(1)	(2)	(3)
i)	Specific gravity	0.915-0.935
ii)	Tensile strength, Mpa	6.9-17.2
iii)	Hardness	D 45-60
iv)	Deflection at 66 Psi degree centigrade	41-44
v)	Clarity	Translucent

Different colours of the plastic film are used for different purpose and is given in Table 3.

Table 3 Different Colour of Plastic Film

Sl No.	Film Type	Purpose	Remarks
(1)	(2)	(3)	(4)
i)	Transparent film	Early crops	Winter spring season
ii)	Black film	Weed control and warming of the soil	—
iii)	White colour	Cool the soil	Summer
iv)	Yellow colour	Killing of the bacteria/insects	—

4.6 Equipment Requirements

4.6.1 The disc used in machine shall conform to all the requirements as stipulated in IS 4366 (Part 1).

4.6.2 The frame should be rigid.

4.6.3 Dust free and self-centering bearings should be provided. The bearing should be reasonably dirt-proof and properly aligned.

4.6.4 Adequate arrangement for lubrication of bearing shall be provided.

4.6.5 Transport wheels should be provided for transportation of the machine from one place to other.

4.7 Workmanship and Finish

4.7.1 The disc shall be finished as specified in IS 4366 (Part 1).

4.7.2 The welding of the various parts shall be satisfactory in all respects (*see* **7.1** of IS 822).

4.7.3 The components should be free from pits, burrs and other visual defects. The exposed metallic parts shall be free from rust and shall have a protective coating, which will prevent surface deterioration in transit and storage.

5 MARKING

5.1 Each machine shall be marked with the following particulars:

a) Manufacturer's name and his recognized trade-mark, if any;
b) Model number; and
c) Batch or Code number or Sl No., if any.

5.2 BIS Certification Marking

Each machine may also be marked with the Standard Mark.

5.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

MGIPF—879 Deptt of BIS/2008—30 1 2009—300 Books

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This Indian Standard has been developed from Doc: No. FAD 20 (1645).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed by the Manager, Govt. of India Press, Faridabad